Georgia Institute of Technology

Department of City and Regional Planning

The Combination of Mobile Applications and Games as a New Method for Community Engagement

Using Race to School as an Example

LiWei Xie

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Advisor: Nisha Botchwey

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Abstract

The importance of community engagement has long been recognized in the planning field; however, it is still rather hard to achieve Citizen Power, the highest level of Arnstein's famous ladder of citizen participation. At the same time, most of the engagement methods are outdated and not as efficient and effective as users have wanted. We now live in a new era with the accelerating growth of information and communication technology. It has given us new opportunities and tools that we never had before to change the way people engage in public processes. The high efficiency and large capacity of information and communication technology provides new solutions to old problems with a new hope for democracy revolution. Among the various tools of technology, mobile application (app) is a promising one for the community engagement.

On the other hand, according to both theories and practice, humans are easily engaged while playing games. Based on that theory, scholars have explored the idea of using games in community engagement and named the method, Immersive Planning Model. In a similar notion, Dr. Nisha Botchwey invented a board game called Race to School (RTS) in one of her workshops to teach elementary school children about planning. The game is well-received and Dr. Botchwey is expecting to enlarge its influence.

Therefore, based on the two concepts, mobile apps and gamification, this paper discusses the possibility of combining the two, which is to develop a RTS mobile app, to advocate planning knowledge.

Key Words: Mobile Applications, Gamification, Community Engagement Method, Race to School

Chapter I. Introduction

Since the civil rights movement, community engagement has become increasingly more important in the planning realm. The processes and results from that engagement reflect the empowerment of the citizens. However, it is no simple task for planners to gather all the input and balance the interests of different parties. In order to better facilitate the work of planners, the methods adopted in the field are constantly evolving to become more effective and efficient.

This paper reviews the traditional methods for community engagement to discuss their strengths and weaknesses. More importantly, the paper identifies the key trend in information and communication technology that is transforming the social behaviors by products like mobile applications (apps). At the same time, gaming has been recognized as an immersive planning model by Gordon and Schirra (2011). Gamification has brought new approaches to engagement of the planning process. An approach of combining mobile apps and gaming in community engagement has now emerged.

Dr. Nisha Botchwey from Georgia Tech designed a board game called Race to School in one of her undergraduate planning workshops while she was working for University of Virginia. The game was successful in teaching elementary school students planning knowledge in a fun and relaxing way. An upgraded virtual version of the game could increase its power in many ways. Based on the board game and research on planning related mobile apps, this paper discusses the formality and design of such an app, as an experiment and blueprint for future realization.

Chapter II. Literature Review of Community Engagement Methods

1. Community Engagement in Planning

In her famous article, A Ladder of Citizen Participation, Sherry R. Arnstein defined that citizen participation is a categorical term for citizen power (Arnstein, 1969). She notes that citizen participation or community engagement should be a distribution of power that gives the powerless citizens a chance to be heard in the planning process. In 1968, Edmund M. Burke expressed similar views in his Citizen Participation Strategies. He lamented the failure of citizen participation in projects like Urban Renewal, creating confusion and conflict instead of effective inputs. Community engagement is a symbol of democracy for Burke and often revered as a means to enhance the democratic process (Burke, 1968).

The dilemma of community engagement has been well depicted in Arnstein's famous Ladder of Citizen

Participation, which has eight rungs from lowest level of nonparticipation to the highest, citizen control. (See Figure 1) Arnstein criticized the prevalent phenomenon of using citizen participation as a tokenism which is merely an "empty ritual of participation" (Arnstein, 1969).

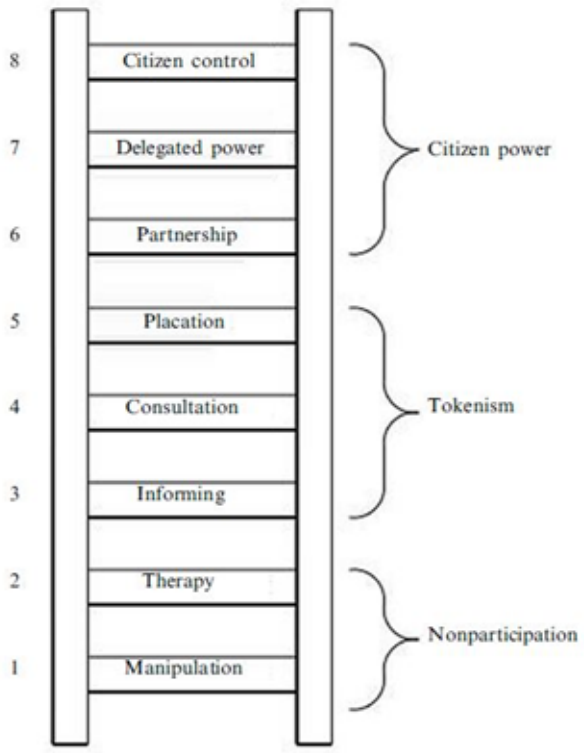

Figure 1. Arnstein's ladder of citizen participation (Arnstein. 1969)

Stuart Hashagen explored the levels of community engagement in his article, "*Models of Community Engagement*", by analyzing the definition of "engagement". Terms like community consultation and community involvement can be used to characterize previous policies between governing bodies and communities. He differentiated engagement from consultation and involvement, explaining that engagement has two systems, governance and community. Consultation is a one-way communication process. Involvement is controlled by government with decided structure and decision-making processes (Hashagen, 2002). Hashagen (2002) sees community engagement as collaborative relationships, the engagement asks for a dialogue and is a focus for attention.

As community engagement evolves, planners have explored numerous techniques or tools in the field to pursue higher levels of citizen participation that reflect greater citizen power. The traditional methods for community engagement before the prevalence of computer science and Internet include public hearings, neighborhood meetings, citizen advisory committees, citizen surveys, etc. These approaches have been used for a long time and are still the major tools in the planning field. However, now that we are in the Information Age, access to mobile phones and Internet are changing the landscape of community development with a lot of potential or realizing more citizen participation.

2. Traditional Methods of Community Engagement

When talking about the methods of community engagement, it is important to clarify that there is no single, undifferentiated or overriding strategy (Burke, 1968). Because there are quite a few different kinds of organizations that engage in planning, including city jurisdictions, consulting firms, real estate developers, community development organizations, non-profits etc. The strategies or methods used by those entities have to be determined by given objectives. (Burke, 1968) Under this notion, Burke then identified five strategies for community engagement based on different objectives. The five strategies are namely education-therapy, behavioral change, staff supplement, cooptation, and community power.

According to Burke's elaboration, education-therapy strategy is based on the form of citizen training in which citizens are not only cooperating to solve community problems but also cultivating a sense of community identification. Secondly, behavioral change strategy is similar to education-therapy but is deliberately oriented in the change of people. It uses group membership to influence individual behavior, for instance, the citizen participation in the urban renewal literature. Thirdly, staff supplement strategy is the reflection of voluntarism. It is usually used to fulfill the tasks that can't be carried out by staff resources, such as a voluntary fund-raising agency. Fourthly, cooptation has been defined as "the process of absorbing new elements into the leadership or policy determining structure of an organization as a means of averting threats to its stability and existence." (Selznick, 1948) This strategy views citizens as obstructions instead of contributions. Finally, community power strategy is applied to exert the influence that is normally outside the formal political structure of a community. Such power could be significant in shaping community decisions. Burke admits the advantages and limitations of each strategy and reminds that the strategies have to depend upon certain conditions and assumptions in order to be effective (Burke, 1968).

James Glass adopted Burke's argument of linking objectives with strategies and criticized the fact that citizen participation was often an end itself, which was only needed for democracy justification (Glass 1979). Glass proposed five general objectives of citizen participation: "information exchange, education, support building, decision-marking supplement, and representational input" (Glass, 1979). See Table 1. The first three objectives are associated with the administrative perspective while the last two are more closely related to the citizen perspective (Glass, 1979). This is consistent with Hashagen's interpretation of engagement with governance and community systems. Thus, Glass identified the techniques of community engagement in use during his time. Some techniques used nowadays are not included in his analysis but listed in Table 1 below, adapted from Glass' summary.

Table 1. The objectives of citizen participation[1]

Perspective	**Category**	**Objective**
Administrative Perspective	Unstructured	Information Exchange
	Structured	Education
		Support Building
Citizen Perspective	Active Process	Decisoin-Making Supplement
	Passive Process	Representational Input

Table 2. The objectives of different techniques in citizen participation[2]

Objectives Techniques	Information Exchange	Education	Support Building	Decision-Making Supplement	Representational Input
Drop-in Centers	*				
Neighborhood Meetings	*				
Agency Information Meetings	*				
Public Hearings	*				
Citizen Advisory Committees		*	*		
Citizen Review Boards		*	*		
Citizen Task Forces		*	*		
Nominal Group Process				*	
Analysis of Judgment				*	
Value Analysis				*	
Citizen Survey					*
Delphi Process					*
Charrettes or Workshops		*	*	*	
Online Forums	*	*	*	*	*
Mobile Applications	*	*	*	*	*

Of all the techniques identified in the table, only some of them are used frequently in community engagement. This literature review will choose the representatives of each category, namely neighborhood meetings, advisory committee, citizen surveys, charrette or workshop, and on-line forum to illustrate their uses, advantages and drawbacks.

a. Neighborhood Meetings

This unstructured technique is one of the frequently used methods in community engagement, and very representative of the Unstructured Category in Glass's table. The neighborhood meetings are often "centered around recently produced plans or current problems" which planners in charge intend to share information (Glass, 1979). Atlanta's Neighborhood Planning Unit (NPU) system is a good example of this tool. The City of Atlanta is divided into 25 NPUs, "which are citizen advisory councils that make recommendations to the Mayor and the City Council on zoning, land use, and other planning issues" (City of Atlanta, 2012)

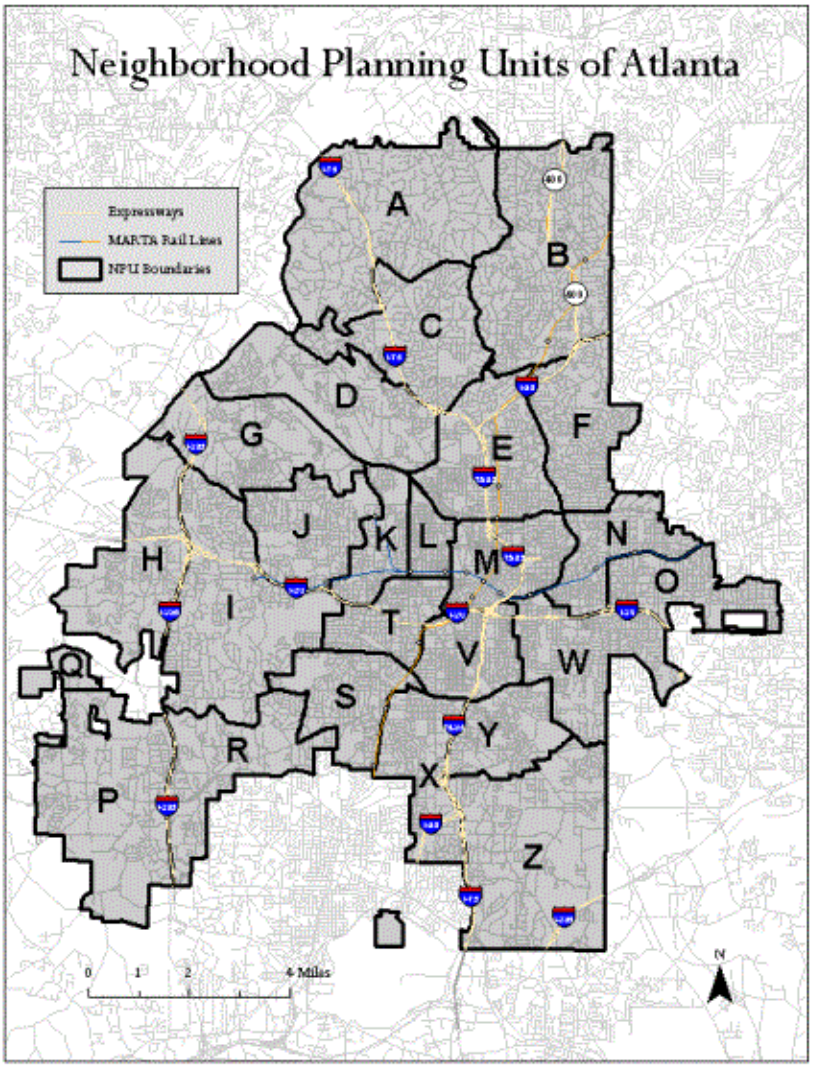

Figure 2 Atlanta NPU Map[3]

The measurement of the success of this technique is usually the number of citizens at the meetings. However, the planners can't predict who will attend, how many people will show up, and what type of input will be provided (Glass, 1979). In addition, it is bounded to time and space. Thus the result may not be representational or effective.

b. Advisory Committee

The citizen advisory was first used to meet the participation requirement of the Housing Act of 1954 (Glass citing Zimmerman 1972, p.5). It is supported by four characteristics: limited authority, organizational ties to a specific government or agency, large membership, and membership reflecting the socioeconomic makeup of the population served by the government or agency (Glass citing Arnstein and Metcalf 1975, p.20-21)

For example, the Atlanta BeltLine organized two advisory committees in their community engagement method, namely, Tax Allocation District Advisory Committee (TADAC) and Atlanta Beltline Affordable Housing Advisory Board. They are established to make recommendations on the relevant issues, such as the issuance of TAD bond proceeds, affordable housing policies; monitor implementation of the BeltLine plan etc (The Atlanta BeltLine, 2013).

Advisory committees and other so-called structured techniques are appropriate for educational and support-building objectives. But they don't provide citizens "a direct voice" in the planning process, which indicates no sharing of power.

c. Citizen Surveys

Derived from sample survey research methodology, citizen surveys are designed to collect data on people's opinions on all kinds of issues, like evaluations of city services, citizen views on governmental policies etc (Glass citing Aberbach and Walker 1972, Caputo 1973, Green and Bruce 1976, Lovrich and Taylor 1976). Classified by Glass as a passive process, there are certain limitations of citizen surveys. Firstly, it is a sample survey which means only some of the citizens are involved. Secondly, the respondents of the survey might not realize that they are participating in the planning process (Glass, 1979). Finally, the surveys are mainly for gathering information, they are not identified with the other objectives, namely information-exchange, education and support building or decision-making supplement (Glass, 1979). It is a typical one-way communication with pre-determined structure and no feedback.

d. Charrette or Workshop

In order to address the weaknesses of public hearings, planners have adopted charrettes or workshops to

change the one-way communication process. Participants in these meetings usually include representatives of relevant government agencies, developers, community groups and citizens with the professional planners or architects facilitating the procedure (Lennertz et al., 2008). A charrette normally lasts between four and seven days, some can take months, depending on the complexity of the issues, and involves an intensive series of meetings and design sessions (Lennertz et al., 2008). Because of the significant time commitment of a charrette, all participants might not be able to stick with the whole process. As a consequence, there could be dropouts of a charrette, which would affect the quality and continuance of the outcomes.

The spectrum of 'public hearings' to 'charrettes' is a move from non-participation to citizen power, or an increase of effectiveness in community engagement. The most important benefit of it is the social capital resulting from face-to-face dialogue and collaboration (Gordon et al., 2010). Healey (1996) advocated that the charrette can be a pivotal tool in advancing the ideals of the communicative planning model, which draws on Habermas' discourse ethics and the concept of communicative rationality as a normative principle.

However, there are quite a few limitations of charrettes that need to be considered. The first caveat is associated costs. According to Lennertz et al., including preparation and implementation phases of a charrette, it can range from $75,000 to upwards of$ 250,000. Secondly, it consumes a lot of time and energy both from the organizers and participants, and inhibits wider engagement of citizens because of the significant time commitment. As a result, participants may not be able to stick with the whole process. People could drop out because of various reasons. Lastly, summarizing the work of Dryzek (1990), Gordon and Koo (2008), Gordon and Manosevitch (2010) and Young (2000), Grodon et al. (2010) identified another important weakness of the charrette as the imbalance of power that occurs in a confined physical space. In the charrette, the well-trained professionals or facilitators "dictate the rules of engagement and control information", which undermines the effectiveness towards communicative planning (Gordon et al., 2010).

e. Online Forum

For his conclusion, Glass thinks that at that time, "there is no single technique that is able to satisfy all five objectives" (Glass, 1979). He urged "the development of a continuous, multifaceted system of citizen participation" (Glass, 1979). Today, when our world abounds with information technology, the Internet and the mobile phones have already brought a revolution to community engagement. Online forums and mobile applications, as the mobile version of the websites, are the new methods for engagement and could meet the five objectives laid out by Glass.

Take community engagement consultant company, MindMixer as an example, which has led a new trend of e-governance. ImproveSF is one of its successful projects. MindMixer created this online platform for

citizens in San Francisco to participate in local community engagement. It encourages people to submit ideas to the government, and in return the participants win unique prizes from the Rewards Store. The prizes include Cooking Class for Four with Chef Remy, voucher for the Farmers Market to Voicemail Greeting from the Mayor (ImproveSF, 2013). This gamification of the community engagement has not only made the process fun and interesting, but also attracted valuable input from citizens. The five objectives, information exchange, education, support building, supplemental decision making and representational input, are embedded into this multifaceted tool.

Jeff Howe has coined this new method as crowdsourcing and he was the first to give it a definition. He states that "crowdsourcing represents the act of a company or institution taking a function once performed by employees and outsourcing it to an undefined (and generally large) network of people in the form of an open call. This can take the form of peer-production (when the job is performed collaboratively), but is also often undertaken by sole individuals. The crucial prerequisite is the use of the open call format and the large network of potential laborers" (Howe, 2006).

Crowdsourcing has been applied in many fields like photography, design, humanitarian work, etc. It is a great concept of how the Internet can connect people in the virtual world despite of time and space, especially in a low-cost way. Community engagement in city planning has benefited from and improved by the new format. Other similar crowdsourcing websites for planning are IdeaScale, UserVoice and Crowdmap (Goodspeed, 2012).

3. Mobile Apps as a New Approach

Due to the shortcomings of traditional methods discussed above, it is critical to develop new types of techniques and tools to advance the community engagement field. One direction for the evolution of community engagement is to combine mobile technology and gaming for better engagement practices.

a. Global Trend of Information and Communication Technologies

Since the end of the 20th Century, our world has been growing rapidly in information and so has communication technology, indicated by the large proportion of the population with Internet access and mobile subscriptions. From 1997 to 2009 alone, the growth was astounding worldwide. For example, in low-income countries, it increased from 0.01% to 4.3%; in middle-income countries, from 0.21% to 23.8%; and in high-income countries, from 11.2% to 51.9% (Pratt et al. 2012). It is even more drastic for the rapid expansion of mobile phones,. In low-income countries, it grew from 0.05% to 28.9%; in middle-income countries, from 1% to 71%; finally, in high-income countries, from 17.9% to 96.3% (Pratt et al. 2012).

According to International Telecommunication Union (ITU), by 2011, one third of the world's population

had access to the Internet and 45% of the users were young people below the age of 25 (ITU). On the other hand, there are 5.9 billion mobile-cellular subscriptions when the population of our planet is about 7 billion. The global penetration of mobile technology has reached 87%, and 79% in the developing world (ITU). The figure is phenomenal and leads to a future where everyone can be reached by the Internet or mobile phone.

As the rising star of the mobile phone industry, smart phones have won consumers' hearts by the combination of Internet access and mobile subscriptions. The market share of smart phones has been increasing significantly especially in high-income countries, like the United States. Google has been gathering information on smart phone consumer behaviors worldwide. For instance, in the United States, smart phone penetration has increased from 31% in Q1 2011 to 44% in Q1 2012, and the owners are becoming increasingly reliant on the devices, which leads to the conclusion that "smart phones have become an indispensable part of our daily lives" and they "have transformed consumer behavior" (Google, 2012).

It is irrefutable that this megatrend of information and communication technology has reshaped human society in many ways. People are much more connected than ever before in human history. At the same time, the technologies have provided more and more tools for many industries and sectors to make communication more efficient and effective. For planners especially, this trend means that it is easier and faster to engage communities when information and communication technologies are widely available.

b. Mobile Applications

1) Penetration

The technology penetration usually means the percentage of users in a population. As the byproduct of smart phones, mobile applications or mobile apps in short, have achieved tremendous success. Along with the high penetration of the Internet and mobile phones, many mobile apps are created and many are downloaded by consumers.

Based on a 2010 report of International Data Corporation (IDC), in that year, more than 300,000 apps were downloaded with a total of 10.9 billion times. IDC also predicts that in 2014, the downloading figure will reach 76.9 billion and have the revenue of US $35 billion (MobiThinking, 2012). The growth is exponential as shown by Figure 3 from Statista.com about the cumulative number of apps downloaded from the Apple App store from June 2008 to January 2013.

After studying how mobile phones are changing the world and people's behaviors, Evans-Cowley concluded that mobile phones could be a participatory technology in our "always-on" society and proposed creating a real-time city (Evans-Cowley, 2010). Later when smart phones were invented as "better" mobile phones,

the demand has been high and people started to replace the old phones with the new smart ones. As a result, mobile apps, have become a must in people's daily lives.

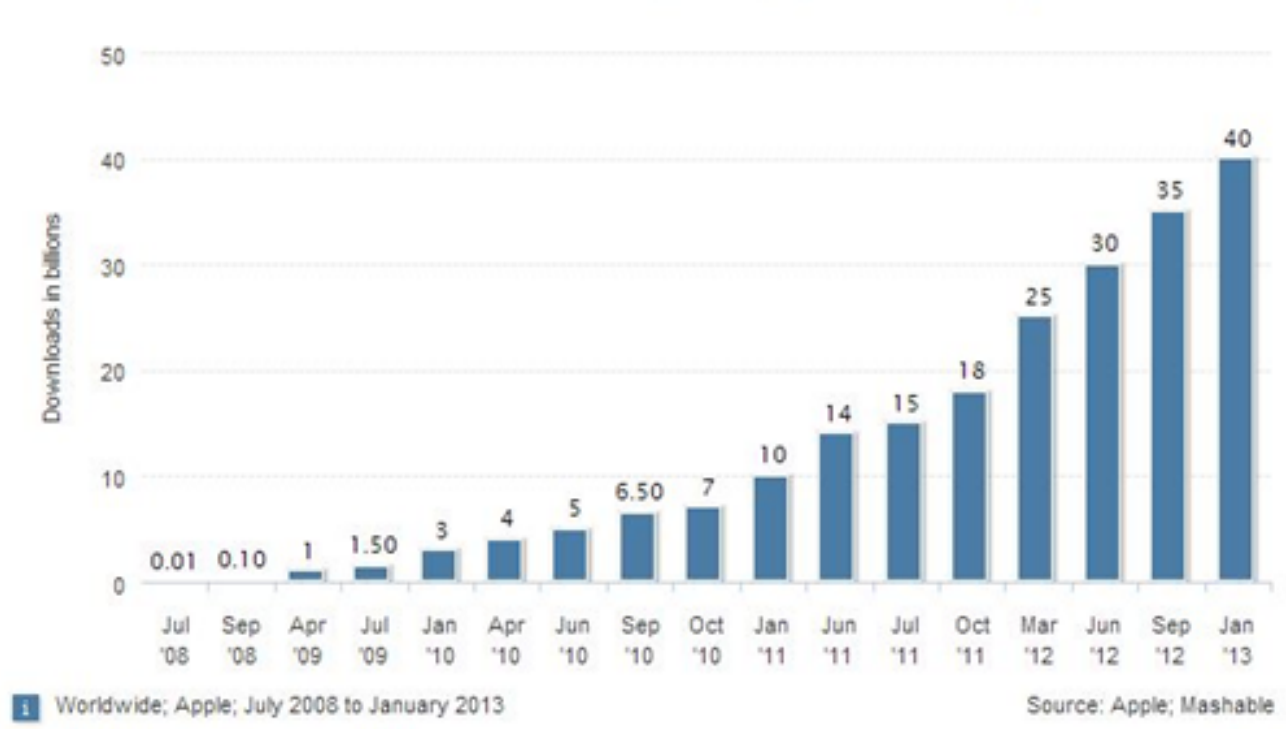

Figure 3. Cumulative number of apps downloaded from the Apple App Store from June 2008 to January 2013 (in billions)[4]

Mobile Apps means "application program for a computer or phone operating system" (American Dialect Society, 2011). The word app had even been selected as the Word of the Year for 2010 by the American Dialect Society. Mobile Apps have existed long before 2010, but because of their extreme popularity, marketing promotion of all kinds of companies trying to sell their app products, plus the arrival of 'app stores' for various operating systems for phones and computers, mobile apps' influence has exploded in recent years.

Recently in the planning world, planners have started to use the mobile apps as tools for increasing participation in local governance and planning. Because the apps are opportunities for getting connected with the crowd's wisdom (Evans-Cowley et al., 2012) and as part of the big digital age techniques, they can help build social capital for e-democracy (Mandarano et al., 2010) Despite the seemingly bright vision, there is little literature discussing the possibility of mobile apps in community engagement. Only some media reports can be found on this topic.

Evans-Cowley and Kubinski conducted a survey in July 2012, one of the very first, to investigate the usage of mobile apps in the planning profession. 108 planners from across the United States participated in the

survey, 96% of whom either own a smartphone or plan to purchase one in the future (Evans-Cowley et al., 2012). The table 3 below is the result from the study.

Table 3. Survey Results

		Frequency				
Types of Apps		Never use this type of app	Daily	Twice or more a week	Weekly	Monthly
	Note taking apps (such as notes, quick office, office 2, etc.)	23%	22%	19%	14%	22%
	File sharing apps (such as Dropbox)	51%	8%	13%	10%	18%
	Social media apps (such as Twitter, Facebook, etc.)	8%	72%	11%	8%	0%
	Productivity apps (such as Photoshop, Word, etc.)	40%	15%	15%	10%	21%
	Presentation apps (such as PowerPoint, Prezi, etc.)	56%	7%	8%	7%	22%
	Planning specific apps	69%	7%	9%	4%	11%

At the bottom of Table 3, the planning specific apps include Accela, ESRI BAO, FEMA, Sitewise, Walkscore, Zoner, and etc. Although this survey is meaningful for us to have a glimpse of the relationship between the planning field and mobile apps, which lacks enough substantial research, the result above is not entirely relevant to the professional field or community engagement sake.

2) Strengths and Weaknesses

Mobile apps have a promising future and have started to serve as great tools for planners. But every coin has two sides. The following is a primitive summary of the pros and cons of mobile apps.

Firstly, the most evident strength of apps is the efficiency they can achieve. An app can be downloaded by an unlimited number of people without the limitation of time and space. Secondly, it is also relatively cost-effective compared to the traditional methods of community engagement like the charrette. Thirdly, the digital platform could provide and integrate more tools, for instance Google Maps, to deliver better visualization and engagement services to the public. As a result, the inputs from the public could also be better managed and transmitted.

As for the weaknesses, first and foremost, the penetration of smartphones has not passed half of the population even in developed countries like the U.S., which means there is a technology divide. The population who doesn't have access to the mobile apps would be in a disadvantaged position, for example, people with less income, lower education level, older age, etc. It would raise a lot of concern on the equity issue. How to engage those who don't have access to mobile apps should always be considered when using smart phones for citizen participation. Finally, it takes longer time to create a mobile app than old fashioned methods like public meetings. Besides, it also requires a lot of different resources to support an app developing project. An average planning agency might not have the capacity to run such project.

3) Future

Despite the strengths and weaknesses of mobile apps, as the old Chinese saying goes, we shouldn't give up eating for fear of choking. We should expand our choices and enrich our toolbox. Based on the discussion above, it is clear that the virtual tools are the ones that could possibly meet the five objectives of citizen participation. They are shaping our future.

c. Gaming

Simulation games have been an effective approach for planners to reshape community engagement with the guidance of the so-called immersive planning model (Gordon & Schirra, 2011). According to Gordon and Schirra, who invented the concept, immersion builds on the feeling of presence. Further citing Ermi and Mayra's work on Fundamental components of the gameplay experience: analyzing immersion in 2005, three forms can take place in immersion experience, namely challenge based, sensory, and imaginative. This immersive strategy can help planners maximize their abilities to attract public attention, create a sense of 'being there', and more importantly, to create empathy to be able to think from others' perspective instead of just their own.

Gordon and Schirra presented a game called Participatory Chinatown when talking about digital role-playing games in public meetings. In the game, participants learn to empathize with the needs and desires of a pre-set character and are required to make decisions accordingly (Gordon et al., 2011). Despite the fact that there is a gap between making decisions in a game and in real life context, players reported that after playing the game, their perspectives about local issues are broadened and they feel more connected to their community (Gordon et al. 2011). Gordon et al. commented that Participatory Chinatown was effective in creating imaginative immersion with elements of challenge-based and sensory immersion included in the experience.

The biggest concern with gaming is associated with what Johann Huizinga calls the "magic circle". The rules and structures of the games are separated from the real life. The role-playing games could somehow

evoke the empathy of the players but would not guarantee a behavioral change in reality. However, vice versa, because of this separation, participants could play with broader perspective and without being confined to their personal situation. It is good for the education and support building objectives of citizen participation when people are more accepting of ideas.

4. Conclusion

The planning field needs new and innovative tools for community engagement. However, the design for such tools has received little attention in planning schools (Gordon et al., 2010). While some city municipalities have started to embrace the idea of mobile apps to improve the engagement process, in the academic world, there is a dearth of literature exploring the possibilities. The sizable gap could benefit from more case studies and real-life experiments.

On the other hand, based on the global and national megatrends of information and communication technology, virtual tools like mobile apps will continue to occupy larger and larger share of the market, and also have more and more impacts on our life style. Driven by this trend, the "continuous, multifaceted system" of information and communication technology, would be created and bring us closer to the true democracy of citizen participation and better community engagement.

Chapter III. Existing Online Tools

Planning apps are among the more than 300,000 apps in the market in a single year. Evans-Cowley (2012) documented the apps relating to the planning field and classified various mobile apps used by planners based on their usages and functionality. Based on her survey and additional research, I have identified four categories of planning apps as follows.

Table 4. Categories of Existing Online Tools

Category	Description	Representatives
News Media	Send out information relevant to planning; generally include apps of magazines and newspaper.	American Planning Association, American City and County, Planetizen.
Communication	Engage the public using social media and government portals.	Facebook, Twitter.
Transportation Information	Provide transportation information to the public using mapping tools.	Embark Inc.
Promotion of Planning Knowledge	Raise awareness and educate the people as the foundation for future community engagement.	Walk Score, Cycle Atlanta.

1. News Media

The news media category generally includes apps of magazines and newspaper serving as information hubs for planners, for instance, American Planning Association, American City and County and Planetizen. These apps are usually installed by academics, practitioners and planning students to get news and exchange ideas about the field.

Take Planetizen, the public-interest information exchange platform as an example. The major pages of this app are News and Jobs, which indicate the exchanging information.

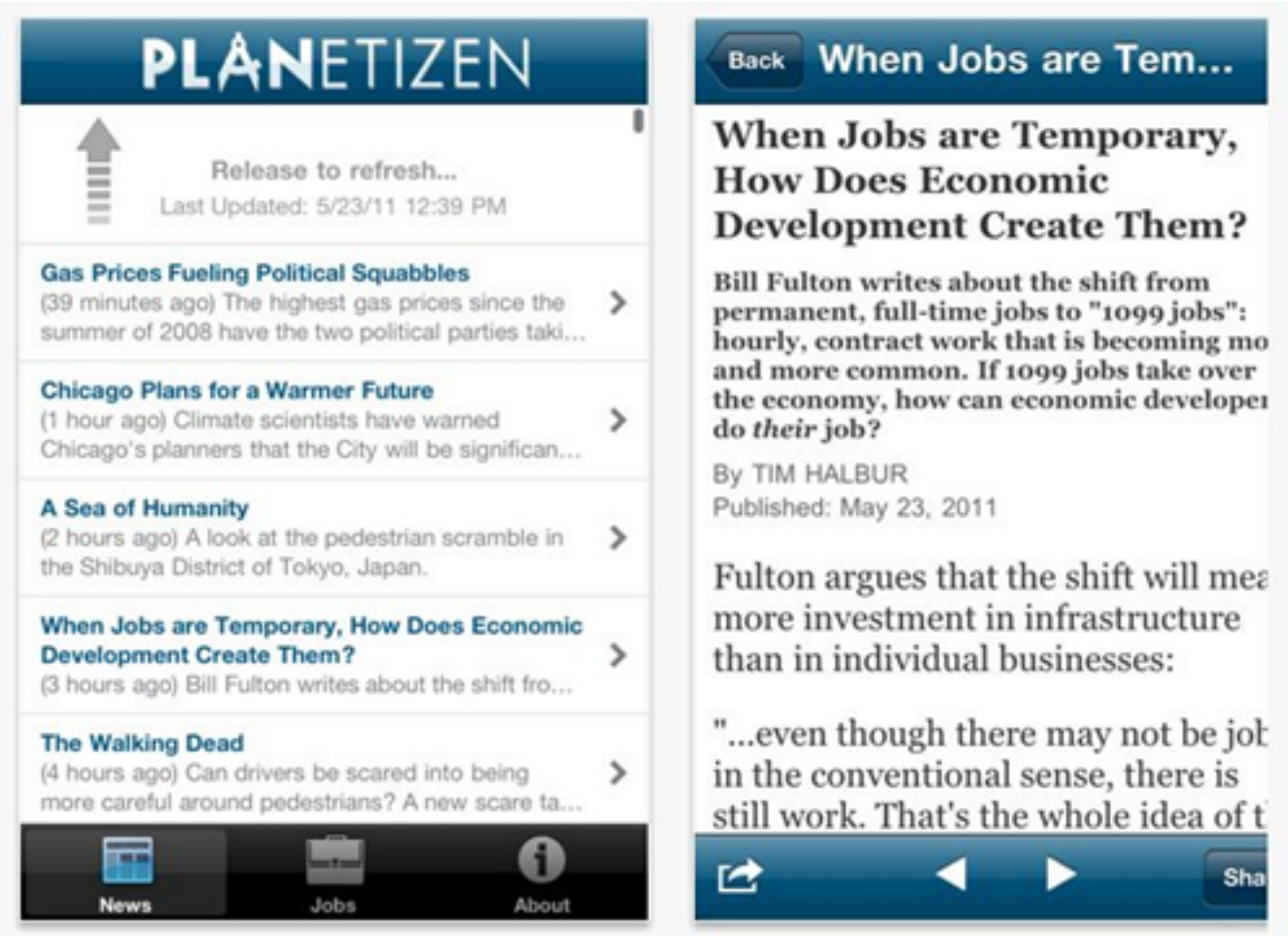

Figure 4. Screen shots of Planetizen App

2. Communication

Apps like social media and governmental portals can be seen as the communication tools for planners or administrators to engage the public. People can follow the account of an agency on Facebook or Twitter, and leave messages to let their voice be heard. Vice versa, planners can share their ideas or projects on the web page to get input from the public.

Besides the official website (see Figure 5), the Atlanta Regional Commission also has a Facebook page (see Figure 6) and Twitter account (see Figure 7) to get connected with the public. Due to the different formats of the web pages, the website contents are adjusted to accommodate different portals.

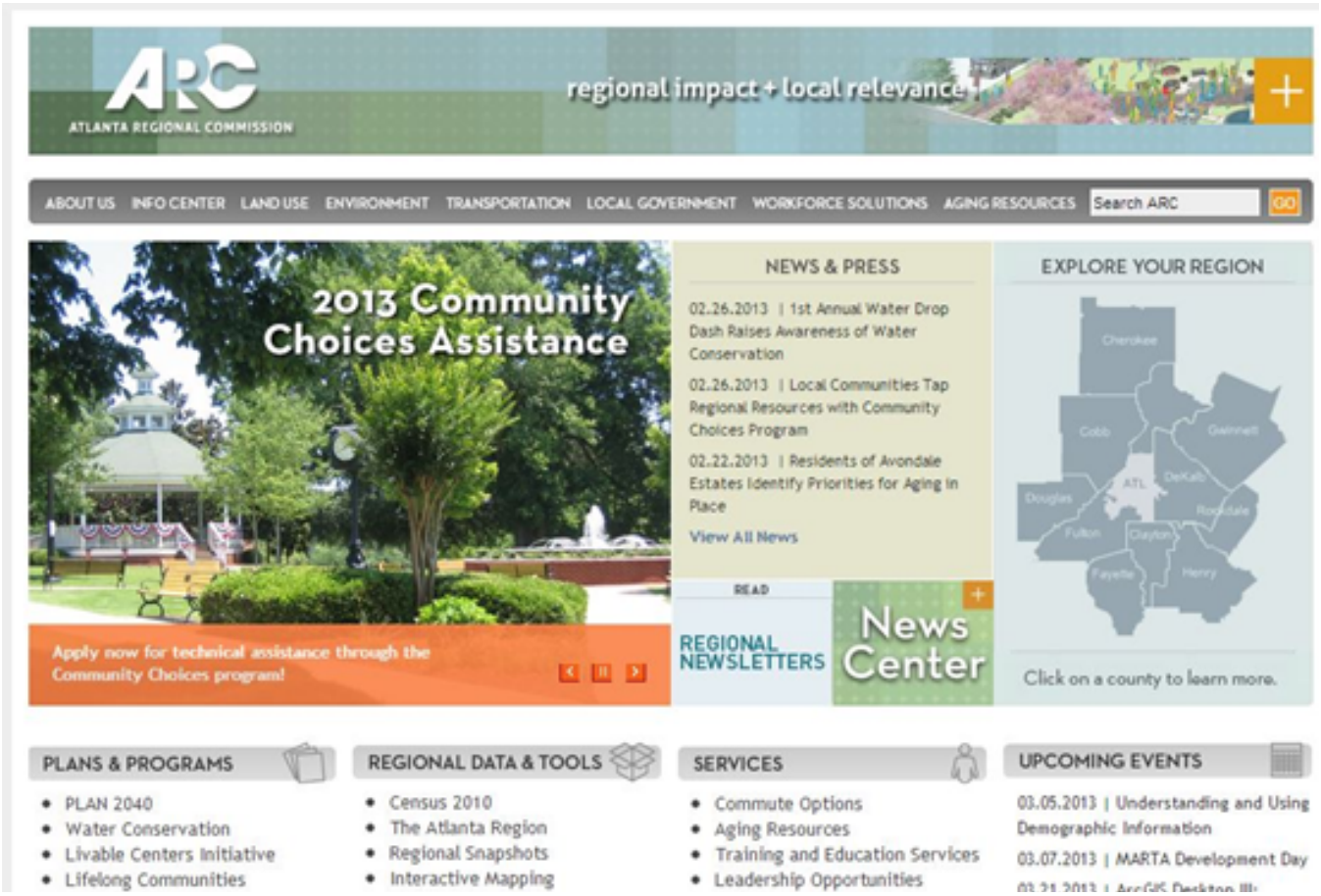

Figure 5. Screen shot of ARC official website

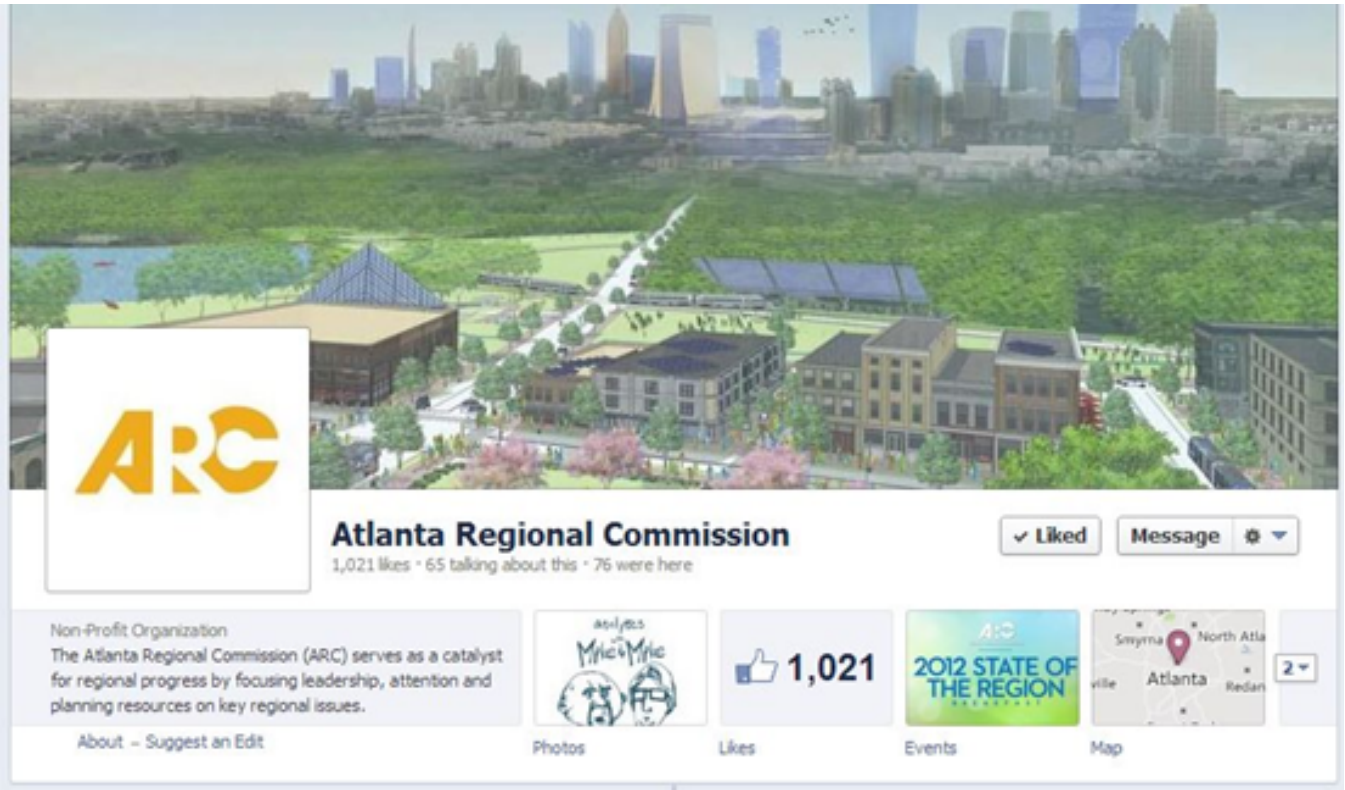

Figure 6. Screen shot of ARC Facebook page

Figure 7. Screen shot of ARC Twitter page

3. Transportation Information

Mapping is an essential part of planning and the most widely used tool for interactions with the public, especially when it comes to the topic of transportation. Mobile Apps like the ones developed by Embark Inc. for mass transit, enable people to get access to the real-time schedules of public transportation and plan their trips ahead of time. They have served as great advocacy for the public transportation.

The following figures are from Embark NYC Subway app.

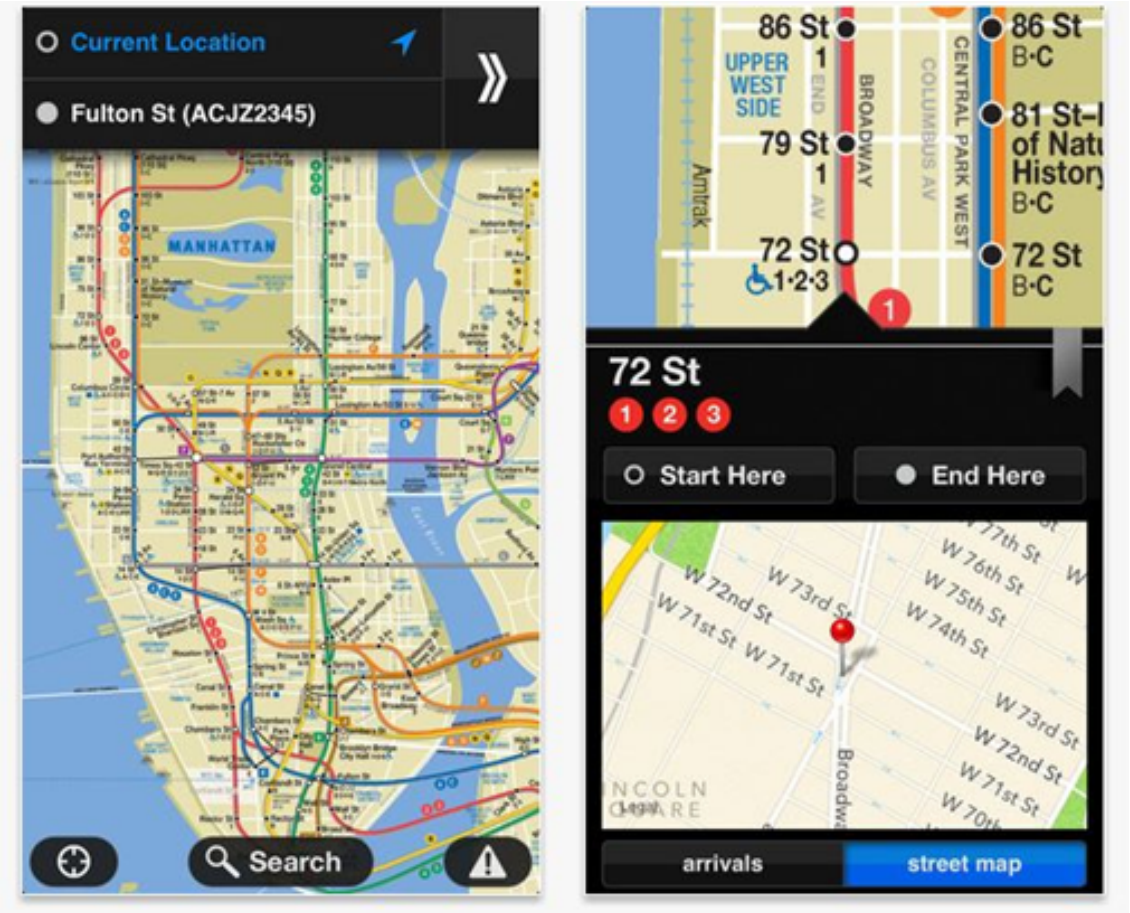

Figure 8. Screen shots of Embark NYC Subway App

4. Promotion of Planning Knowledge

A key factor of community engagement is raising people's awareness and promoting planning knowledge, so that in the future, citizens can be better engaged in the planning process and give back effective and efficient input. Under this guideline, some apps are created to serve this purpose of promoting planning. There are different subgroups under this category using different approaches.

Basically, apps for promotion of planning knowledge have very direct goals, usually delivering one simple concept or message, for instance Walk Score. It promotes the idea of walkability by calculating the walk score of an address. According to its methodology report, Street Smart Walk Score includes walking routes and distances to amenities, road connectivity metrics such as intersection density and block length and scores for individual amenity categories. But the factors included in the method are not complete. For instance, it has left out some intangible factors like crime and visual quality, which are very important and decisive to people's choices. One app like Walk Score won't solve the whole planning problem and is part of the big picture, but it's a good start as an initiative to send out positive message.

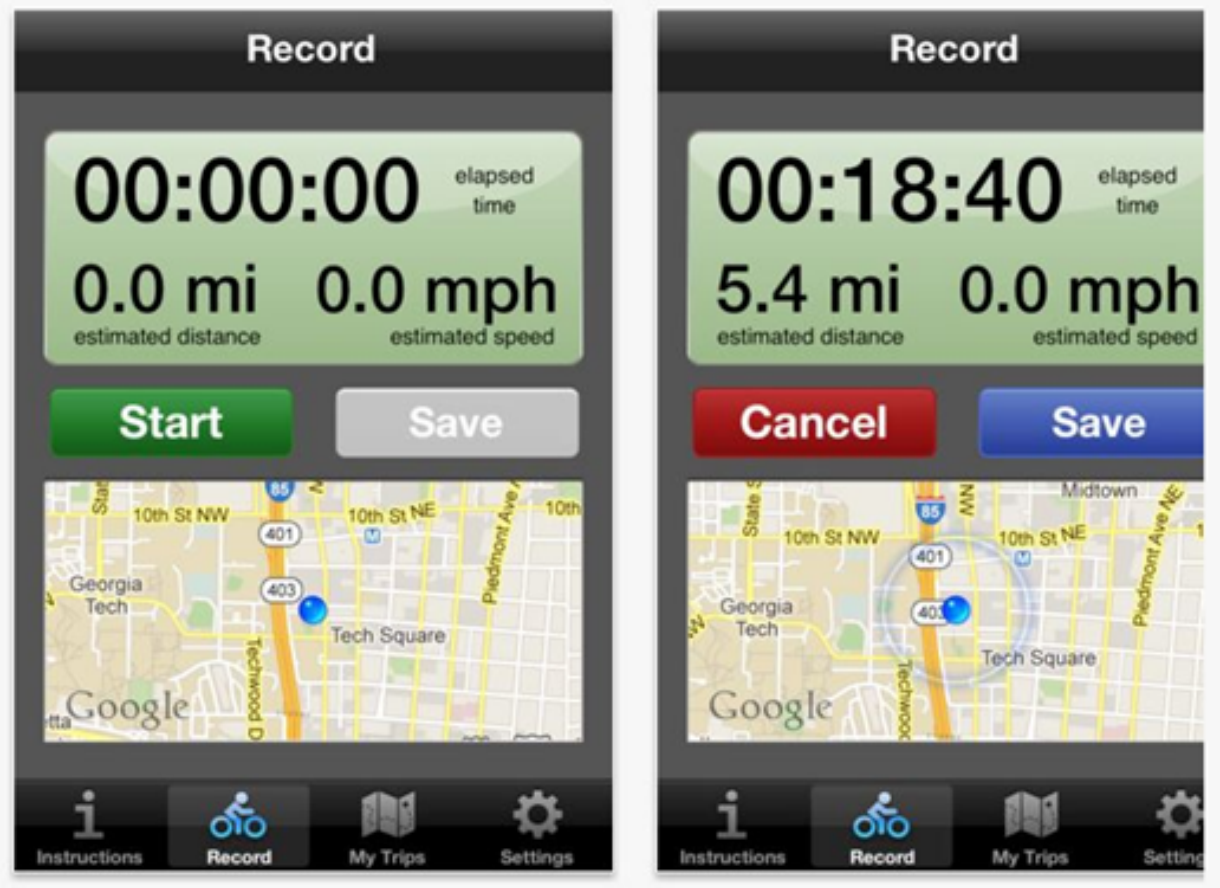

Figure 9. Screen shots of CycleAtlanta App

Another concept which has gathered humongous popularity is cycling. There are quite a few apps for cycling in the country. It also overlaps with the third category of Transportation Information because of its map feature. For instance, if you live in New York City, the most walkable city in the nation and 9th in the bikeable ranking according to Walk Score, the top 5 apps for biking are Citi Bike, New York City Bike Map, New York Bike, Ride the City and Cycle Tracker Pro. Those apps provide the bike map for bikers, track the bike infrastructure and even relate to personal health training.

In 2012, Georgia Institute of Technology developed an app that has the features mentioned above. It is called Cycle Atlanta, which the developers can use to improve the biking infrastructure in the city by asking users to record their bicycle trips. The transportation planners will then be able to collect the data to make Atlanta more bike-friendly (Cycle Atlanta, 2012).

Chapter IV. Case Studies of Planning Gamification

a) Terminus

Atlanta is a city lacking of public transportation and its citizens depend largely on personal automobiles to commute. The sprawling pattern of the development has caused a lot of problems in terms of social division, public health, sustainability etc. Therefore, in order to achieve the goal of building a city with a better transit system, it is important to educate the public, not only the adults, but also the future generation about the importance of public transportation.

Under the notion of public support, three graduate students from Georgia Tech created the game, Terminus to teach high schoolers about transportation planning (Georgia Tech News, 2012). While working for Atlanta Regional Commission over the summer, civil engineering students, Amy Ingles and Denise Smith, and public policy student, Johann Weber cooperated with Clark Atlanta University's Summer Transportation Institute to research transportation planning in metro Atlanta. The Summer Transportation Institute is established by United States Department of Transportation (USDOT) and the Federal Highway Administration (FHWA). In this program, middle and high school students participate in a series of events which are designed to encourage students towards professions in the transportation industry, including administrators, political scientists, social scientists, computer scientists, and engineers. (Clark Atlanta University, 2011) In 2012, the game, Terminus, was created as an innovative and interactive method which is more welcomed by the high school students than past methods.

In Terminus, the participants play the roles as District Chairs, all of whom "sit down to decide how to spend a pool of resources on transportation projects for each district" (Terminus Rules and Gameplay). A set of projects serve as alternatives for the chair to choose from based on the characters of the district.

The chair of a specific district will need to convince other chairs to vote for a project to "build" it. While selecting the right project for the district, the chair must consider the priorities of the residents, who provide the resources for building the project. The constraints of the game include point requirements of all districts, cost under 100,000 credits and time limit of one hour (Terminus Rules and Gameplay).

The players get most of the district information from the district card, which has written down district overview, community description, required points, community engagement survey of some critical issues and comments from the residents (Terminus Rules and Gameplay). So the player would be a chair of an urban area, suburb, or rural with different features and requirements. The potential projects the players can choose from include international airport terminal, air traffic control system, freight rail track realignment, bike/ped improvements, freight rail yard and maintenance facility, circulator bus, suburban commuter bus, heavy rail improvements, commuter rail line, urban corridor improvements, rural corridor improvements, downtown streetcar, light rail, arterial intersection improvements, local intersection improvements, arterial realignment, road resurfacing, urban highway expansion, rural highway expansion, signal synchronization, large urban interchange, urban multi-use path, suburban multi-use path, and rural multi-use path (Terminus Rules and Gameplay). Each project is given scores for equity, environment and economy issues. User group, benefits, detriments and price are also mentioned for consideration (Terminus Rules and Gameplay). Samples of district card and projects card are attached in Appendix B.
The thoughts behind Terminus not only include transportation design, politic coalition, negotiation, but also regional thinking, environment protection, budget control and etc. Take the regional thinking as an example. The residents in one district have to commute to other districts for work. Thus a transportation project is the linkage of multiple districts. It needs to serve the interests of multiple parties to be able to get the support. It could be a bit challenging for high school students at first. But after they take some time to digest the information, it is very educational and rewarding. As Weber commented, "People approach it (Terminus) in different ways, but it was really fun and well-received." (Georgia Tech News, 2012)

b) Race to School

There are 133,000 K-12 schools, 4,300 colleges and universities in the U.S.. 25% of the total U.S. population goes to school every day. In 1969, 48% of the children walked or biked to school, but today the figure has declined to 13%. (NCCOR and National Academy of Environmental Design, 2012).

Dr. Nisha Botchwey, Associate Professor in the School of City and Regional Planning at Georgia Tech, designed a board game called Race to School to promote principles of healthy neighborhoods[5] and encourage physical activity in children. It was first played by 3rd and 4th graders from Johnson Elementary School in Charlottesville, Virginia in 2012 as a part of a project in partnership with the elementary school, neighborhood planner and Dr. Botchwey's Neighborhood Planning Workshop. Prior to the day the students play Race to School, they went through a three-part curriculum to understand the principles of healthy

neighborhoods. Later they went on a scavenger hunt to take photos of the neighborhood components, which were being used in Photovoice essays and presentation to the members of city council. These prior researches formed the basis of the game and reinforced the knowledge and experiences. In the final part of the project, students played the game and enjoyed it with laughter and debates. (Botchwey, 2012)

In term of the game instruction, it conceptualizes the route from home to school for elementary school kids and transforms the route into a racing competition on a path with various different squares. The first to reach the finish line wins. (See Addendum I for the game board of Race to Johnson Elementary.)

The ideal number of players for the game is 4 to 5. Each player will have a game piece to represent him or her. By rolling the dice, the players will move along the path according to the number. There are special squares that present challenges or opportunities to the players. For instance, at the bus stop square, the player can choose to "wait for the bus and lose 3 turns, but ending up only a few squares away from school" (Botchwey). Or alternatively, not get on the bus, and walk to school instead by continuing to roll the dice. The park shortcut is similar with the bus stop. These squares help the children be aware of the trade-off they are making.

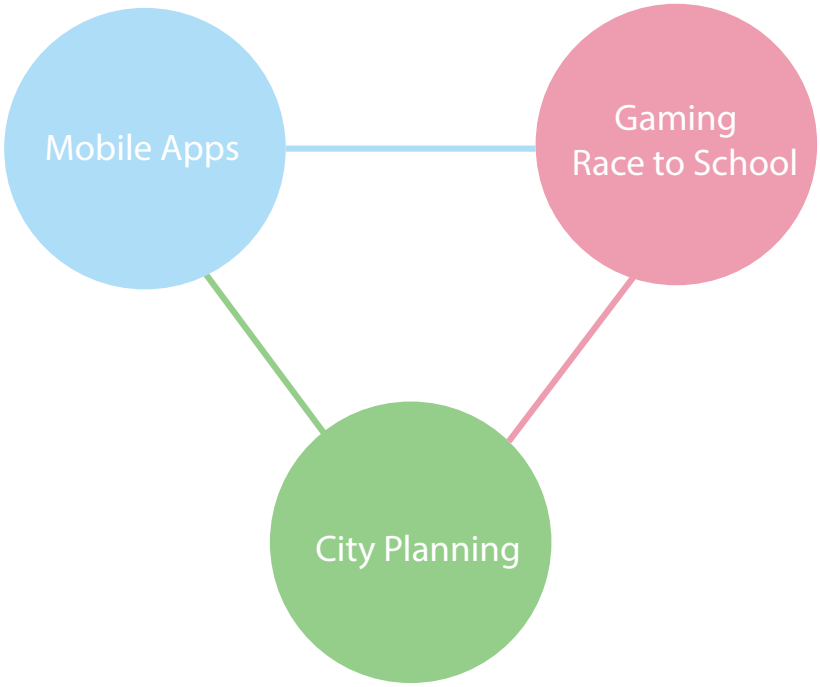

Figure 10 Conceptualization of Race to School Mobile App Version

When the player lands on the 'chance' square, he or she has to make a planning decision according to the options on the card. For example, do you want street lights or recycling in your community? The player will think over what is lacking in the neighborhood and then make a decision. Maybe there is enough street lighting, but not enough recycling bins in the kid's situation. Thus the player can elaborate on his or

her opinion, even start a discussion around the issue.

The path on the game board also contains "colorful neighborhood ingredient squares" namely services, safe spaces, transportation, green space and houses. The player who lands on one of the special ingredient square collects corresponding cards from other players. They have to explain the reasons they choose specific cards. Then the player that collects the cards will decide the best answer and reward the winner with a re-roll card.

Throughout the game, participants are guided to a discussion about the built environment in a fun and relaxing atmosphere. The gamification of the process creates a lively communication not limited to conventional methods.

Chapter V. Design Concept of Race to School Mobile App

The success of Race to School is influential and there are many schools trying to introduce the game to their pupils. It is recognized as a fun and effective way to teach planning knowledge. However, if we want to get more people involved and increase the game's influence, the board game lacks the muscles to pull it off. Luckily, in the 21st century, the information and communication technology has provided us the new tool to upgrade the game. Therefore, the idea is to design a mobile app based on the original concept of Race to School with additional features.

Strengths of Race to School Mobile App Version

There are many advantages of the Race to School mobile app version. First, far more people can get access to the game without the limitation of space and time. The traditional board game has to be played with all the participants physically in the same location. It takes elaborate arrangement to make it happen while the number of participants is still very limited. But with the mobile app version, all you need to do is downloading the app on to your mobile device and you can play it anywhere, at any time. The number of the participants is no longer limited, thousands of users can get access to it with relative lower cost.

Second, the information users generate can be easily gathered and saved for analysis. The easy management of large datasets is one of the biggest advantages of information technology. Once the mobile app is installed on the users' devices, the data can be transmitted through the Internet to formulate a dataset. It is meaningful and useful to gather such data, for example, analysis of travel mode, inspection of infrastructure condition, effectiveness of relative programs. The Safe Routes to School program has been established as the advocate for students biking or walking to school, in response to the sharp decline during the last few decades. It has covered all 50 states and more than 13,000 schools (Safe Routes to School website, 2013).

However, the data collection of the programs is not efficient or up to date. It requires the students and the parents to submit paper surveys and then staff manually enter the data. This out-dated data collection method has a long turnaround time, inefficient procedure, and low participation rate. Besides those weaknesses, there is no infrastructure mapping to visualize the programs. If the Race to School app were to be developed, the framework could easily gather data from children's trips to school and contribute to the academic analysis, police patrol and etc.

Finally, the app would help build a connection between the developers and the users. The users are able to submit their findings and suggestions on their routes to school or any other destinations. Similarly, the developers could give feedback to the comments, creating a two-way communication, which is fundamental to community engagement. This type of community engagement is closer to citizen power of Arnstein's ladder.

Limitations of Race to School Mobile App Version

There are limitations of a mobile app creation for Race to School too. Although 44% of the U.S. population used smart phones in 2012 according to the survey by Google, it is still not 100% coverage. This is especially true for students who are not economically independent and less likely to have smart phones. The economic status of a family is also a hurdle to smart phone ownership. The children from lower income families have a lower probability of gaining access to smart phones and the Internet. Besides the technology gap, the development cost of an app definitely has higher short-term cost compared to the traditional board game. It needs more resources to support the operation of the app as well. For instance, a technical personnel must be established to maintain the app and respond to the users' requests. Thus it will raise the status of such project to institutional level.

App Design

The new app may look very different from the board game, while still using the concept of "racing" from one place to a destination. It could be from home to school like the board game Race to School, or from home to work, and other scenarios. Furthermore, there could be more virtual elements to add to it. The following is a list of critical design dimensions.

1. Avatar. Like a game piece representing a player, an avatar could be created to represent the player in the app. Hence the user would be able to choose the features of the avatar, like sex, outfit, hairstyle, etc, to make it personalized.

2. Online mapping. The routes of the game should integrate with online maps, for instance Google Maps. There are many advantages of using online mapping. First and foremost, it

could use the existing global map to find most of the routes in the U.S., which makes it cost-effective, efficient and up to date. On the other hand, an open source like online maps could also enable the users to share the routes easily. For example, Kim, a RTS user, has found a great biking route to school. She can either use GPS to record her trip or draw the path on online maps, then share it with her friends.

3. Information push. In order to provide better services for people walking or biking, desktop push or alerts including weather forecast, transportation information, crime reports, could be customized and sent to the users.

4. Education of planning knowledge. As one of the major objectives, the education function would include features like selecting topics that are closely related to people's daily life, teaching people the relationship between built environment and health, giving useful suggestions or advice.

5. Community research. One page of the app could be dedicated to community research, which is to encourage people to learn about their neighborhoods by assigning tasks under designated topics. Consequently, people might be inspired to improve their living environment from a planning perspective.

6. "My Route". This page is the major gaming part of the app. My Route would first ask the user to set a starting point and an ending point for a potential race. The next step would be selecting a transportation mode, for instance, driving, carpooling, biking, walking, taking the bus or the subway, riding a motorcycle, skateboarding, or some combination of these options. Along the route, when the player has found some hazards or unsafe factors, for example, a missing section of sidewalk, an uncovered manhole, or tree debris, he or she could take a picture or write a comment with geo-reference, and then submit it online. Finally, the app would calculate the time he or she spent completing the route and rank the results in the community circle. It would also send alerts to people near previous posts requesting validation. Additionally, he or she could share the results via other social media sites like Facebook and Twitter.

6. Badges and points. Accumulation of badges and points can always stir players' excitement. By completing some tasks or winning a race, a player will be rewarded badges or points in climbing the ladder of levels. In this way, players are encouraged and will grow attachment to the game.

Preliminary Design

Based on the list of app design dimensions, Figure 11 is a diagram showing the preliminary concept design of the app's major interface.

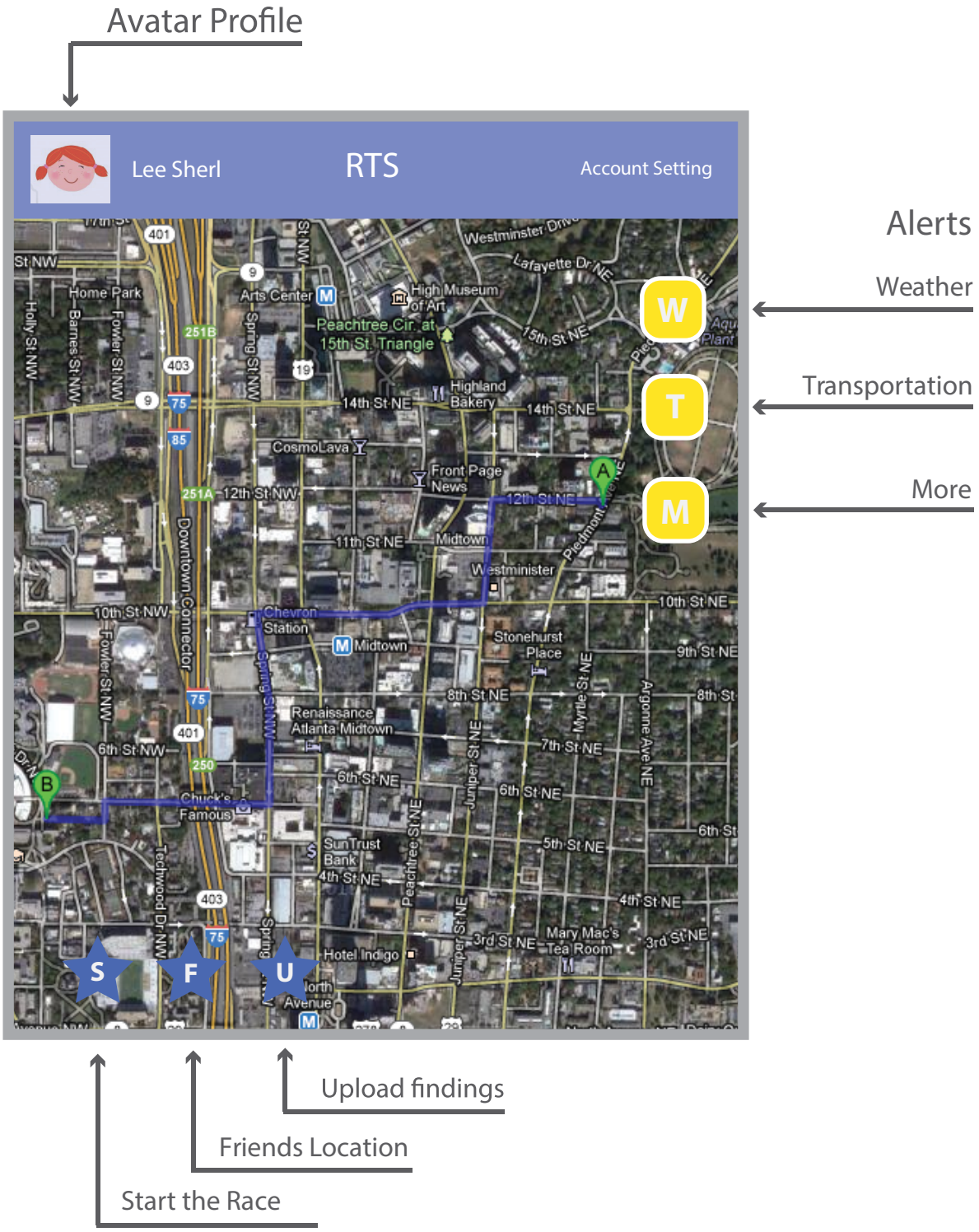

Figure 11 Race to School App Interface Design Concept

The avatar profile can lead users to profile page for editing personal information, including name, sex, profile picture, school, hobbies, transportation mode, current level, collected badges or earned points, etc. The alerts on the right side are examples of information push, for example, the local weather, transportation schedules, planning highlights from local government. The icons at the bottom are for the race. As it written in the figure, S can start the race and recording from place A to B; F is to show the location of friends and their statuses of racing to school; when the user has found some hazard like uncovered manhole, he can upload his findings and comments along using the U button.

In addition to the app major interface design, the following database sources could be recommended to be used in the actual design of the app.

1. Open streets map, e.g. Google Maps, Bing Maps.
2. Public transportation information, e.g. the schedule of buses and subways.
3. Bike infrastructure information, e.g. availability of bike routes and racks, existing public bike sharing program.
4. Crime data from the police department.
5. School district demographics.

Chapter VI. Discussion and Conclusions

Of all the community engagement methods, most of them only serve one or two out of the five objectives (Information Exchange, Education, Support Building, Decision-Making Supplement and Representational Input) with different limitations. The new emerging information and communication technology, represented by mobile apps, has the potential to serve all objectives. For example, a simple online forum can build up the communication bridge between citizens and planning agencies. Planners can send out messages to citizens about new planning issues. Vice versa, citizens can write to planners about their concerns, participate online engagement, and vote to support or veto some projects. The citizen participation can be almost real-time without physical presence, which saves time and money. During this process, it has covered the five objectives. However, it also faces major weaknesses and raises new challenges, for instance, social divide and maintenance costs. Lower income families are less likely to have access to smart phones and Internet. Other than financial barrier, they might also have less energy and awareness to planning issues because of lack of exposure. On the other hand, the design of community engagement apps is crucial and closely related to the effectiveness of the results. Gamification can add fun flavor into the process, which is especially important for engaging school students.

As planners, we should be aware of all the angles of the tools and use them carefully and cautiously. At the same time, we shouldn't isolate the methods from each other. They should be seen as methods that

completing one another. It is the same with mobile apps. The apps are not invented to replace all the other methods and they certainly cannot. The role of the apps should be another option in planners' toolbox.

Endnotes

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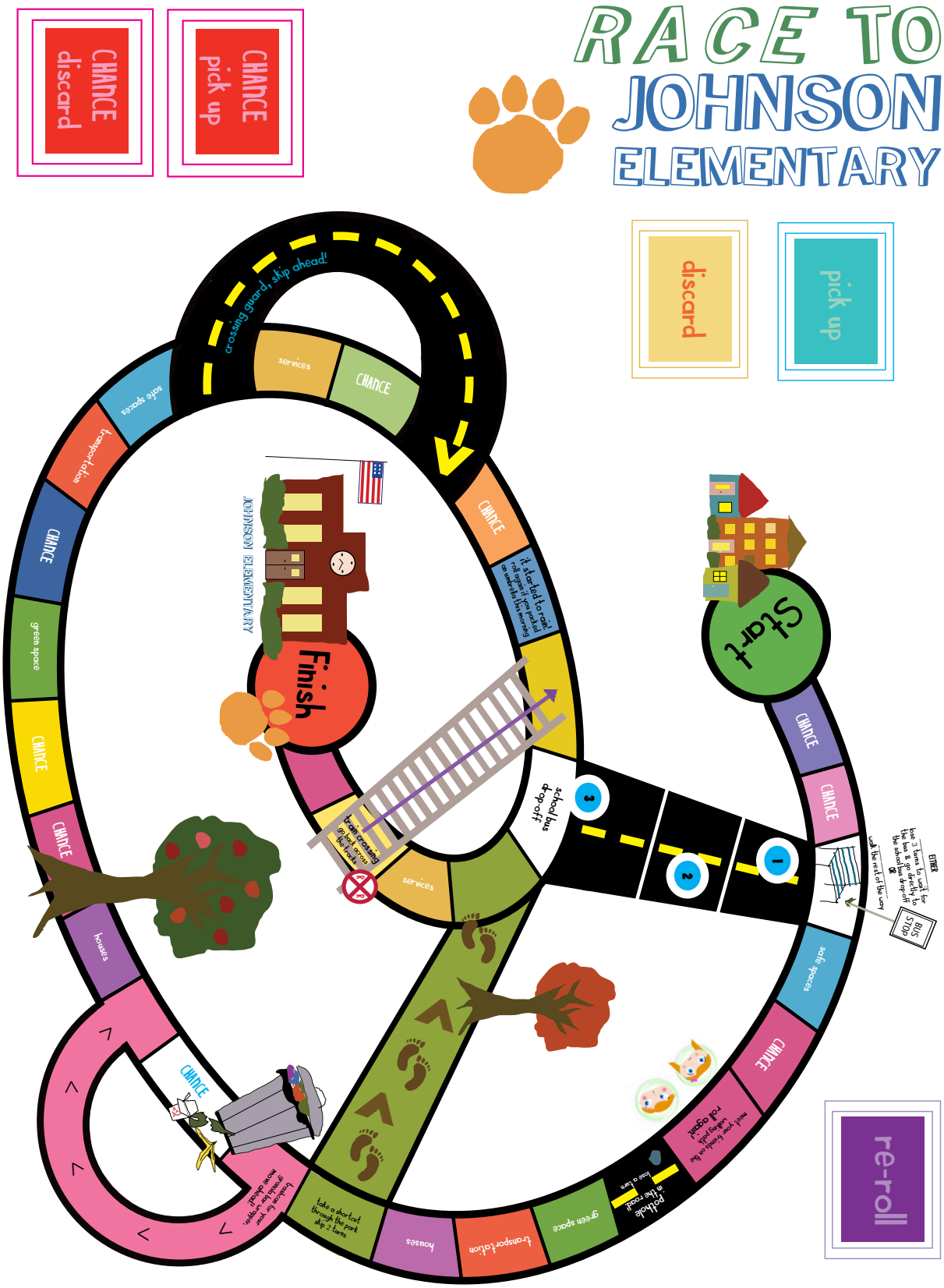
Appendix A

Game board of *Race to School* from Dr. Nisha Botchwey



Appendix B

Sample Terminus Project

District 4

Suburban Commuter Bus

Begin commuter bus service between suburbs and downtown.

Equity		3
Environment		5
Economy		5
USER GROUP:	Commuters	
BENEFITS:	Congestion relief	
DETRIMENTS:	Does not have independent right-of-way	
PRICE:	3,000	

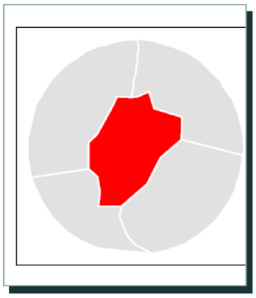
Sample Terminus District

IDENTIFICATION CARD

District 1

District Overview

District 1 is the central business district and economic center of the region. Many residents from the other districts commute into District 1 for work during the week, and a lot of visitors travel into the District during the weekend. This District serves a diverse group of people and requires comprehensive planning to ensure that the needs of these groups are met.



Community Description

- **Community Type:** Urban
- **Population Size:** Large (1,000,000)
- **Density:** Dense
- **Diversity Level:** Highly Diverse

Required Points

Equity	35
Environment	20
Economy	35